REMARKS

Claims 1, 3-5 and 10-13 are pending in this application. Claims 2 and 6-9 have been canceled herein without prejudice or disclaimer. Claims 1, 3 and 4 have been amended and new claims 12 and 13 have been added.

The amendments to the claims are made for clarity. The amendment to claim 1 incorporates the limitations of claim 2, now canceled. The wording has been amended for clarity to recite "a **region** of silicon carbide formed on the monocrystalline silicon substrate" and "a **region** of monocrystalline gallium nitride grown on the region of silicon carbide". Original claim 1 had recited "an **area** of grown monocrystalline gallium nitride." Original claim 2 had referred only to "silicon carbide formed on the monocrystalline silicon substrate." Support for the recitation of "a region" for the silicon carbide may be seen in the Figures of the present application. For example, in Figure 1(F), reference numeral 300 would be the region of silicon carbide, and numeral 410 would be the region of monocrystalline gallium nitride.

The amendment to claim 3 is supported by FIG. 1(G) of the present application, in which the recitation of "silicon nitride as a mask" is replaced by a structural recitation of the location of "a region of silicon nitride", corresponding to "silicon nitride island 220" (specification, page 4, last line, etc.). Similarly, the amendment to claim 4 is supported by FIG. 2(G), with the "region of silicon oxide" supported by "silicon oxide island 720" (specification, page 8, line 3, etc.)

Support for new claim 12 may be found in FIG. 1(F), and for new claim 13 in FIG. 2(F). The specification explains on page 6, lines 8-11, that the gallium nitride 420 grown on the silicon nitride

island 220 becomes polycrystalline and has crystal defects. Similarly, with regard to new claim 13, the gallium nitride 420 grown on the silicon oxide island 720 has crystal defects (page 9, lines 10-13).

Claims 1-5 and 7-11 are rejected under 35 U.S.C. §102(b) as being anticipated by Linthicum '198.

Reconsideration of the rejection is respectfully requested in view of the amendments to the claims.

The Examiner cites FIG. 42 of Linthicum as showing a GaN layer 304 grown locally on a silicon substrate. The reference discusses FIG. 42 in column 16, lines 9-21. Reference numeral 304 is described previously with regard to the other figures, initially in regard to FIG. 34, in column 14, line 19, where it states that: "a layer of 2H-gallium nitride 304 is grown on the aluminum nitride layer 302e." The abstract of Linthicum indicates that a surface of (111) silicon layer is converted to 3C-silicon carbide, and a layer of 3C-silicon carbide is grown on the (111) silicon, and then a layer of 2H-gallium nitride is grown on that.

However, in Linthicum, the gallium nitride layer 304 is **only** shown as grown directly on aluminum nitride.

By contrast, claim 1 as amended, recites: "a region of silicon carbide formed on the monocrystalline silicon substrate; and a region of monocrystalline gallium nitride grown on the region of silicon carbide." Here, "formed on" and "grown on" are product-by-process terms and

require direct contact of these layers. This structure may be seen, for example, in FIG. 1(F) of the present invention, in which reference numeral 300 represents a region of silicon carbide, and reference numeral 400 is a region of monocrystalline gallium nitride.

As noted, Linthicum's FIG. 42 only appears to show GaN grown directly on AlN, not on SiC. Applicant submits that Linthicum does not disclose the structure of amended claim 1, in which gallium nitride is grown on silicon carbide. Moreover, GaN grows differently on SiC than on SiN (page 6 of the present specification), further differentiating Linthicum's structure from that of claim 1.

Claim 3 has been amended to recite the structure shown in FIG. 1(F) and (G), in which a region of silicon nitride 220 is present alongside the region of silicon carbide 300. Moreover, new claim 12 recites the region of polycrystalline gallium nitride 400 grown on the region of SiN 200, in FIG. 1(F). In the present invention, the GaN grows differently on the silicon carbide and silicon nitride, allowing selective etching to remove the GaN above the SiN, resulting in the structure of FIG. 1(G). Applicant submits that these structures are not shown in Linthicum.

This is similarly the case for amended claim 4 and new claim 13, as supported by FIGs. 2(F) and (G), in which region of silicon oxide 720 is alongside of region of silicon carbide 300.

The structures of claims 5, 10 and 11 are also, accordingly, not disclosed by Linthicum.

Applicant further submits that the claims, as amended, are **not obvious** over Linthicum. With regard to growing gallium nitride on other than aluminum nitride, the reference states that:

> "As was described in connection with the embodiment of FIGS. 16-26, the silicon carbide layer 302d'/302c" may be critical to the success of forming gallium nitride

> structures because the silicon carbide is a preferred material template on which to grow the aluminum nitride layer 302e and the gallium nitride semiconductor layer 304." (column 15, lines 44-49)

Gallium nitride layer 304 can be seen in FIG. 35 of Linthicum to be grown on aluminum nitride buffer layer 302e. In Linthicum's FIG. 21, 2H-GaN is grown on silicon oxide buffer layer 202e. None of these structures, however, suggests the monocrystalline silicon/silicon carbide/monocrystalline gallium nitride structure of present claim 1, nor the structures of any of the dependent claims.

Applicant notes in general that a monocrystalline silicon substrate of the present invention comprises areas of monocrystalline gallium nitride grown locally thereon for forming optical devices such as LEDs and other areas for forming electronic devices such as LSIs. The capability of freely placing optical devices and electronic devices will lead to miniaturization and cost-reduction of the end product and can resolve a problem of signal delay between electronic and optical devices since these different kinds of devices can be closely disposed.

Further, because monocrystalline gallium nitride is not grown directly on the monocrystalline silicon substrate but on a monocrystalline silicon carbide that is an interlayer, the present invention can circumvent a problem of crystal defects due to face orientation mismatch. Therefore it is possible to fabricate monocrystalline gallium nitride with favorable high frequency properties.

In short, electronic-optical united devices manufactured utilizing the monocrystalline gallium nitride localized substrate of the invention will benefit from downsizing, cost-reduction and enhanced speed.

Applicant notes that Linthicum '198 does not disclose or suggest that electronic and optical

devices are formed on the same substrate. Without such feature, manufacture of electronic-optical united devices requires taking an integrating method by bonding a substrate with electronic devices and another substrate with optical devices, a method of separately disposing a substrate with electronic devices and another substrate with optical devices, and electrically connecting these substrates. Obviously, it is extremely difficult to pursue downsizing, cost-reduction and enhanced speed in such conventional methods. Applicant submits that there is no suggestion in Linthicum for this benefit of the present invention.

Applicant therefore submits that pending claims 1, 3-5 and 10-13 are novel and not obvious over Linthicum et al. '198.

In view of the aforementioned amendments and accompanying remarks, the claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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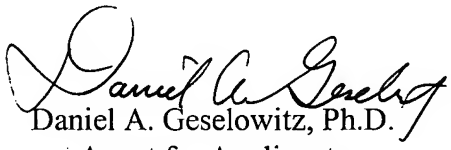

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